

ISOVAL

see EPOXY RESINS

K

- 131 -

KEREMID

Trade name of Rhône-Poulenc

see POLYIMIDE

KINEL

Trade name of Rhône-Poulenc

Product on a polyimide basis filled with glass fibre or graphite

see POLYIMIDE

M

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MAKROLON

Trade name of Bayer

see POLYCARBONATE

NOVOLAC

EPOXY-NOVOLAC RESINS

see also EPOXY RESINS

Base resins

CIBA-GEIGY	DOW	SHELL
EPN 1138	DEN 438	EPIKOTE (EP) 154
EPN 1139	DEN 431	

No.	Material and Supplier	Dose (Gy)	Ultimate flex. strength S (N/mm ²)	Deflexion at break D (mm)	Modulus of elasticity M (N/mm ²)
89	EPN 1138(50) + MY 745(50) + + CY 221(20) + HY 905(120) + + DY 063(0.3) 24 h 120 °C Type ISR ALSTHOM	0	131.5 ± 24.5	9.3 ± 3.2	3.55 ± 0.15 × 10 ³
		6 × 10 ⁶	92.2 ± 6.9	4.6 ± 0.3	3.75 ± 0.13 × 10 ³
		1 × 10 ⁷	68.7 ± 22.6	3.5 ± 1.2	3.56 ± 0.07 × 10 ³
		2 × 10 ⁷	62.8 ± 13.7	3.0 ± 0.7	3.88 ± 0.08 × 10 ³
		6 × 10 ⁷	6.9 ± 0.3	0.7 ± 0.1	1.90 ± 0.24 × 10 ³
90	EPN 1139(100) + HY 906(87.5) X157/2505(0.5) 24 h 120 °C ALSTHOM	0	130.5 ± 23.5	6.7 ± 2.4	3.98 ± 0.05 × 10 ³
		5 × 10 ⁶	103.0 ± 13.7	5.5 ± 0.9	3.63 ± 0.15 × 10 ³
		1 × 10 ⁷	107.9 ± 6.9	6.0 ± 0.5	3.55 ± 0.13 × 10 ³
		2 × 10 ⁷	59.8 ± 26.5	2.9 ± 1.5	3.73 ± 0.18 × 10 ³
		5 × 10 ⁷	28.2 ± 6.3	1.2 ± 0.2	4.05 ± 0.17 × 10 ³
92	DEN 438 + MNA DOW	0	83.4 ± 19.6	4.7 ± 1.2	3.17 ± 0.11 × 10 ³
		5 × 10 ⁶	70.6 ± 13.7	3.7 ± 0.7	3.36 ± 0.15 × 10 ³
		1 × 10 ⁷	83.4 ± 19.6	4.0 ± 1.6	4.00 ± 0.89 × 10 ³
		2 × 10 ⁷	61.8 ± 12.8	3.0 ± 0.6	3.73 ± 0.06 × 10 ³
		5 × 10 ⁷	18.6 ± 11.8	1.1 ± 0.4	3.19 ± 0.90 × 10 ³
93	DEN 431 + MDA DOW	0	92.2 ± 6.9	6.4 ± 0.8	2.87 ± 0.10 × 10 ³
		5 × 10 ⁶	118.7 ± 6.9	9.0 ± 1.8	3.46 ± 0.18 × 10 ³
		1 × 10 ⁷	129.5 ± 4.9	8.9 ± 2.0	3.63 ± 0.11 × 10 ³
		2 × 10 ⁷	127.5 ± 26.5	9.1 ± 3.7	3.85 ± 0.09 × 10 ³
		5 × 10 ⁷	40.2 ± 15.7	1.6 ± 0.7	3.85 ± 0.10 × 10 ³
94	EPIKOTE 154 + MNA + glass tape MICAFIL	0	441.4 ± 18.6	5.5 ± 0.6	1.85 ± 0.10 × 10 ⁴
		5 × 10 ⁶	394.4 ± 12.7	5.2 ± 0.5	1.77 ± 0.06 × 10 ⁴
		1 × 10 ⁷	270.8 ± 44.2	3.6 ± 0.9	1.82 ± 0.10 × 10 ⁴
		2 × 10 ⁷	308.0 ± 21.6	4.1 ± 0.3	1.85 ± 0.11 × 10 ⁴
		5 × 10 ⁷	234.5 ± 3.9	3.0 ± 0.2	1.95 ± 0.16 × 10 ⁴
95	EPIKOTE 154 + DDS + glass fabric MICAFIL	0	430.6 ± 11.8	4.5 ± 0.1	2.53 ± 0.13 × 10 ⁴
		5 × 10 ⁶	387.5 ± 15.7	5.0 ± 0.6	2.47 ± 0.04 × 10 ⁴
		1 × 10 ⁷	317.8 ± 12.8	4.3 ± 0.8	2.27 ± 0.09 × 10 ⁴
		2 × 10 ⁷	264.8 ± 6.9	4.1 ± 0.2	2.05 ± 0.06 × 10 ⁴
		5 × 10 ⁷	165.8 ± 4.9	3.6 ± 0.4	1.49 ± 0.11 × 10 ⁴

No.	Material and Supplier	Dose (Gy)	Ultimate flex. strength S (N/mm ²)	Deflexion at break D (mm)	Modulus of elasticity M (N/mm ²)
96	EPIKOTE 154 + DDM + glass fabric MICAFIL	0	351.2 ± 14.7	3.6 ± 0.4	1.97 ± 0.16 × 10 ⁴
		5 × 10 ⁶	361.0 ± 10.8	3.7 ± 0.2	2.16 ± 0.06 × 10 ⁴
		1 × 10 ⁷	329.6 ± 12.7	3.7 ± 0.1	2.06 ± 0.19 × 10 ⁴
		2 × 10 ⁷	310.9 ± 3.9	3.6 ± 0.9	1.98 ± 0.12 × 10 ⁴
		5 × 10 ⁷	207.0 ± 5.9		1.63 ± 0.11 × 10 ⁴
116	Epoxy Novolac 438 + HY 906 + glass fabric ISOLA	0	458.1 ± 74.6	4.1 ± 0.2	2.41 ± 0.23 × 10 ⁴
		5 × 10 ⁶	457.1 ± 60.0	4.0 ± 0.1	2.46 ± 0.17 × 10 ⁴
		1 × 10 ⁷	446.4 ± 54.0	4.1 ± 0.3	2.53 ± 0.27 × 10 ⁴
		2 × 10 ⁷	345.0 ± 33.0	4.2 ± 0.3	2.27 ± 0.17 × 10 ⁴
		5 × 10 ⁷	187.4 ± 50.0	2.5 ± 0.4	1.63 ± 0.40 × 10 ⁴
117 (a)	Epoxy Novolac 438 + MNA + glass Samica ISOLA	0	316.9 ± 9.8	1.1 ± 0.1	5.81 ± 0.14 × 10 ⁴
118 (a)	Epoxy Novolac 438 + BF ₃ MEA complex + glass Samica ISOLA	0	316.9 ± 9.8	1.1 ± 0.1	5.67 ± 0.14 × 10 ⁴
121	Epoxy Novolac 431 + MNA + accelerator ISOLA	0	464.0 ± 74.6	7.2 ± 0.5	2.44 ± 0.30 × 10 ⁴
		5 × 10 ⁶	434.6 ± 66.7	7.3 ± 0.1	2.45 ± 0.15 × 10 ⁴
		1 × 10 ⁷	365.9 ± 60.8	6.4 ± 0.5	2.35 ± 0.15 × 10 ⁴
		2 × 10 ⁷	260.0 ± 27.5	6.1 ± 1.2	1.77 ± 0.27 × 10 ⁴
		6 × 10 ⁷	180.5 ± 31.4	5.6 ± 0.8	1.52 ± 0.18 × 10 ⁴
			*		
122	Epoxy Novolac 431 + BF ₃ MEA complex ISOLA	0	363.9 ± 15.7	6.1 ± 0.3	2.35 ± 0.14 × 10 ⁴
		5 × 10 ⁶	383.6 ± 5.9	6.7 ± 0.4	2.51 ± 0.74 × 10 ⁴
		1 × 10 ⁷	373.8 ± 36.3	6.8 ± 0.2	2.40 ± 0.23 × 10 ⁴
		2 × 10 ⁷	145.2 ± 24.5	4.2 ± 0.6	1.82 ± 0.69 × 10 ⁴
		6 × 10 ⁷	121.6 ± 26.5	3.1 ± 0.5	6.43 ± 2.34 × 10 ³
123	EPN 1138(50) + MY 745(50) + HY 905(103) + XB 2687(0.25) 24 h 120 °C ALSTHOM	0	118.7 ± 21.6	8.4 ± 3.1	3.30 ± 0.05 × 10 ³
		5 × 10 ⁶	114.8 ± 21.6	9.8 ± 3.4	3.34 ± 0.12 × 10 ³
		1 × 10 ⁷	78.5 ± 8.8	4.3 ± 0.4	3.45 ± 0.13 × 10 ³
		2 × 10 ⁷	53.0 ± 6.9	2.8 ± 0.3	3.51 ± 0.06 × 10 ³

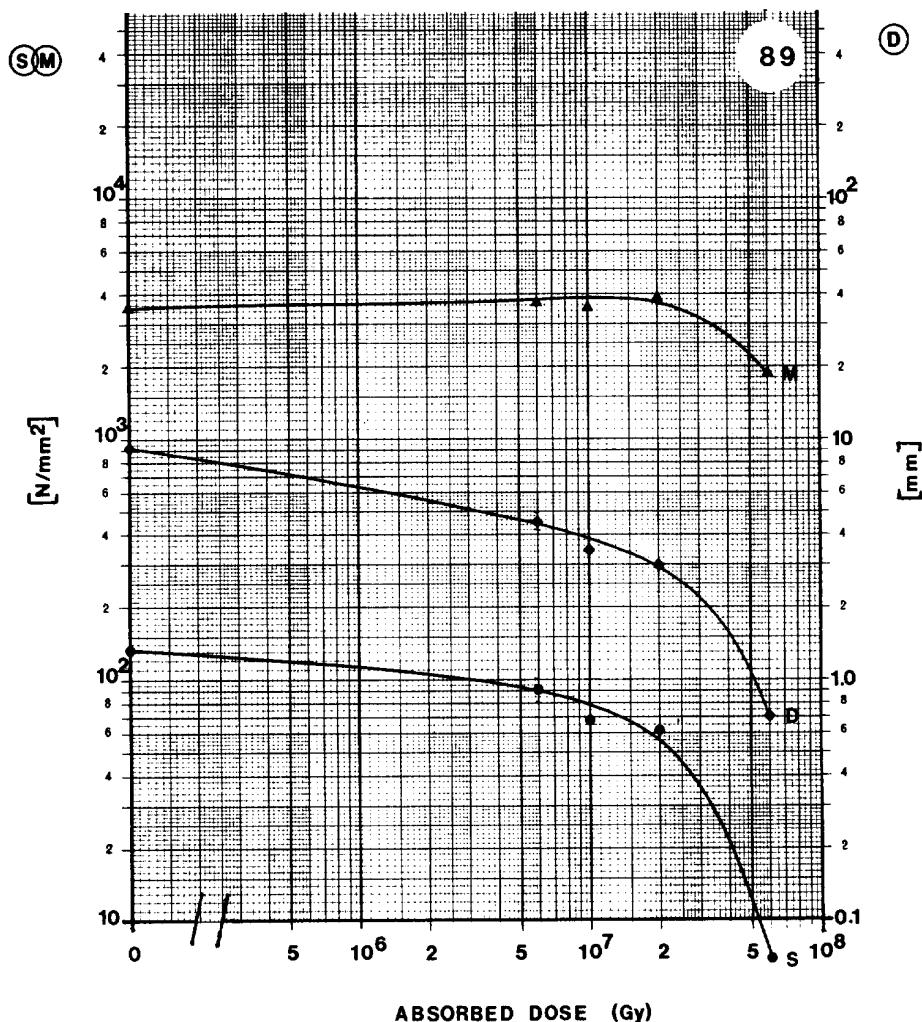
(a) No graph.

No.	Material and Supplier	Dose (Gy)	Ultimate flex. strength S (N/mm ²)	Deflexion at break D (mm)	Modulus of elasticity M (N/mm ²)
124	EPN 1139(100) + HY 905(97.5) + XB 2687(0.2) 24 h 120 °C ALSTHOM	0	124.6 ± 38.3	8.3 ± 3.7	3.49 ± 0.27 × 10 ³
		6 × 10 ⁶	127.5 ± 36.3	8.3 ± 3.2	3.67 ± 0.06 × 10 ³
		1 × 10 ⁷	78.5 ± 2.9	4.0 ± 0.2	3.58 ± 0.14 × 10 ³
		2.5 × 10 ⁷	60.8 ± 7.8	3.2 ± 0.4	3.58 ± 0.14 × 10 ³
		5.5 × 10 ⁷	9.8 ± 2.9	0.6 ± 0.2	3.27 ± 0.35 × 10 ³
154	EP 154(50) + EP 828(50) + + DX 126(60) + DX 127(22) + + accelerator 4 h 80 °C + 4 h 150 °C SHELL	0	145.2 ± 18.6	11.5 ± 2.1	3.04 ± 0.04 × 10 ³
		5 × 10 ⁶	113.8 ± 2.0	10.2 ± 2.2	3.27 ± 0.06 × 10 ³
		1 × 10 ⁷	81.4 ± 26.5	5.0 ± 2.1	3.46 ± 0.01 × 10 ³
		3 × 10 ⁷	45.1 ± 14.7	2.6 ± 0.9	3.33 ± 0.05 × 10 ³
155	EP 154(50) + EP 828(50) + + DX 126(60) + DX 127(22) + Silica(300) + accelerator 4 h 80 °C + 4 h 150 °C SHELL	0	86.3 ± 6.9	1.7 ± 0.1	9.63 ± 0.00 × 10 ³
		5 × 10 ⁶	50.0 ± 2.0	0.9 ± 0.0	1.05 ± 0.04 × 10 ⁴
		1 × 10 ⁷	41.2 ± 1.0	0.8 ± 0.0	1.03 ± 0.03 × 10 ⁴
		3 × 10 ⁷	37.3 ± 2.0	0.8 ± 0.0	9.12 ± 0.48 × 10 ³
203	EPN 1138(100) + HY 906(95) + + DY 062(0.5) 2.5 h 80 °C + 12 h 160 °C CIBA-GEIGY	0	130.5 ± 19.6	8.7 ± 2.2	3.52 ± 0.05 × 10 ³
		5 × 10 ⁶	115.8 ± 19.6	7.1 ± 1.8	3.88 ± 0.17 × 10 ³
		1 × 10 ⁷	122.6 ± 7.8	7.2 ± 0.7	3.95 ± 0.04 × 10 ³
297	EPN 1138(50) + MY 745(50) + + CY 221(20) + HY 905(120) + + XB 2687(0.3) 24 h 120 °C CIBA-GEIGY	0	124.2 ± 24.5	12.4 ± 3.7	3.73 ± 0.25 × 10 ³
		5 × 10 ⁶	91.9 ± 8.8	6.4 ± 0.6	3.80 ± 0.13 × 10 ³
		1 × 10 ⁷	68.9 ± 11.8	4.5 ± 0.9	4.01 ± 0.09 × 10 ³
		2.5 × 10 ⁷	13.7 ± 0.3	1.2 ± 0.4	3.26 ± 0.04 × 10 ³
		5 × 10 ⁷	2.1 ± 0.0	0.7 ± 0.0	5.27 ± 0.00 × 10 ²
810	VETRESIT 14; EPIKOTE 827 + + DDS + glass tissue MICAFIL	0	445.4 ± 3.9	4.2 ± 0.1	2.36 ± 0.04 × 10 ⁴
		1 × 10 ⁷	371.8 ± 13.7	4.6 ± 0.3	2.33 ± 0.03 × 10 ⁴
		3 × 10 ⁷	134.4 ± 19.6	2.0 ± 0.3	1.64 ± 0.07 × 10 ⁴
		6 × 10 ⁷	43.2 ± 17.7	1.1 ± 0.2	1.10 ± 0.19 × 10 ⁴
		1 × 10 ⁸	67.7 ± 6.9	1.8 ± 0.1	1.05 ± 0.10 × 10 ⁴

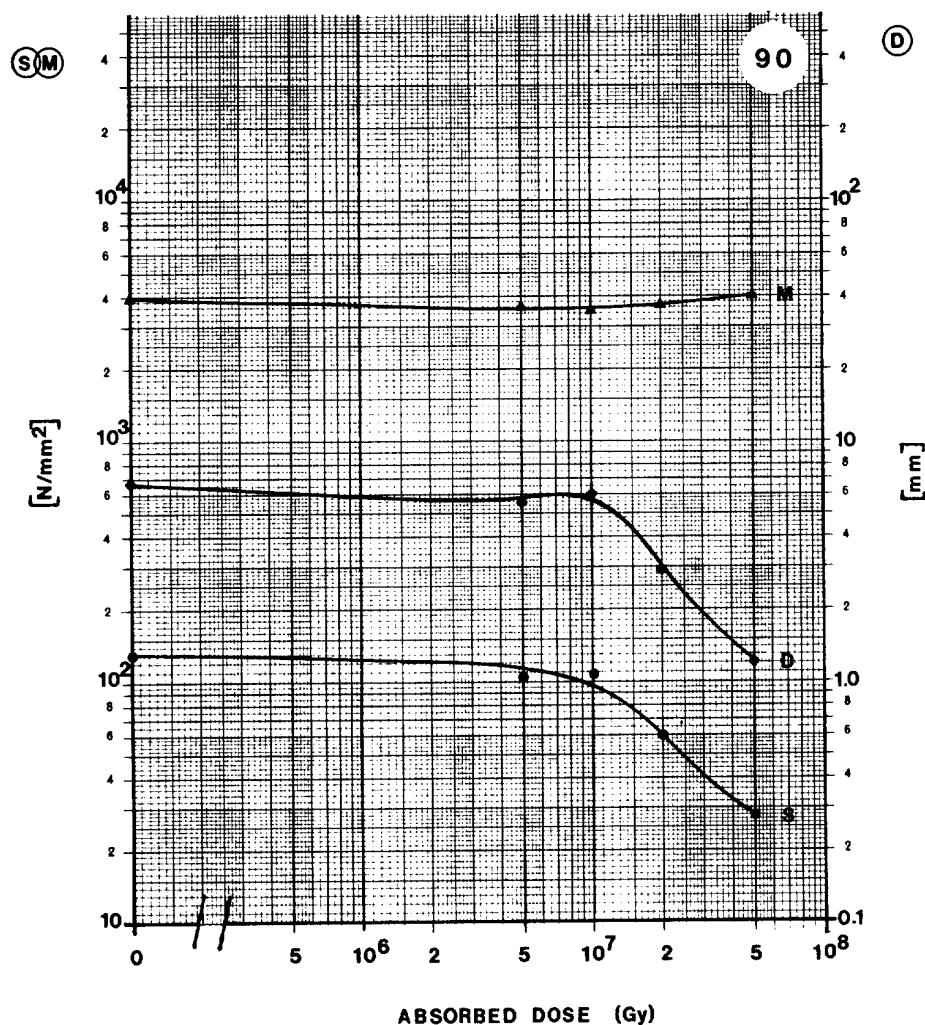
MATERIAL: EPN 1138(50) + MY 745(50) + CY 221(20) + HY 905(120) + DY 063(0,3)

SUPPLIER: ALSTHOM

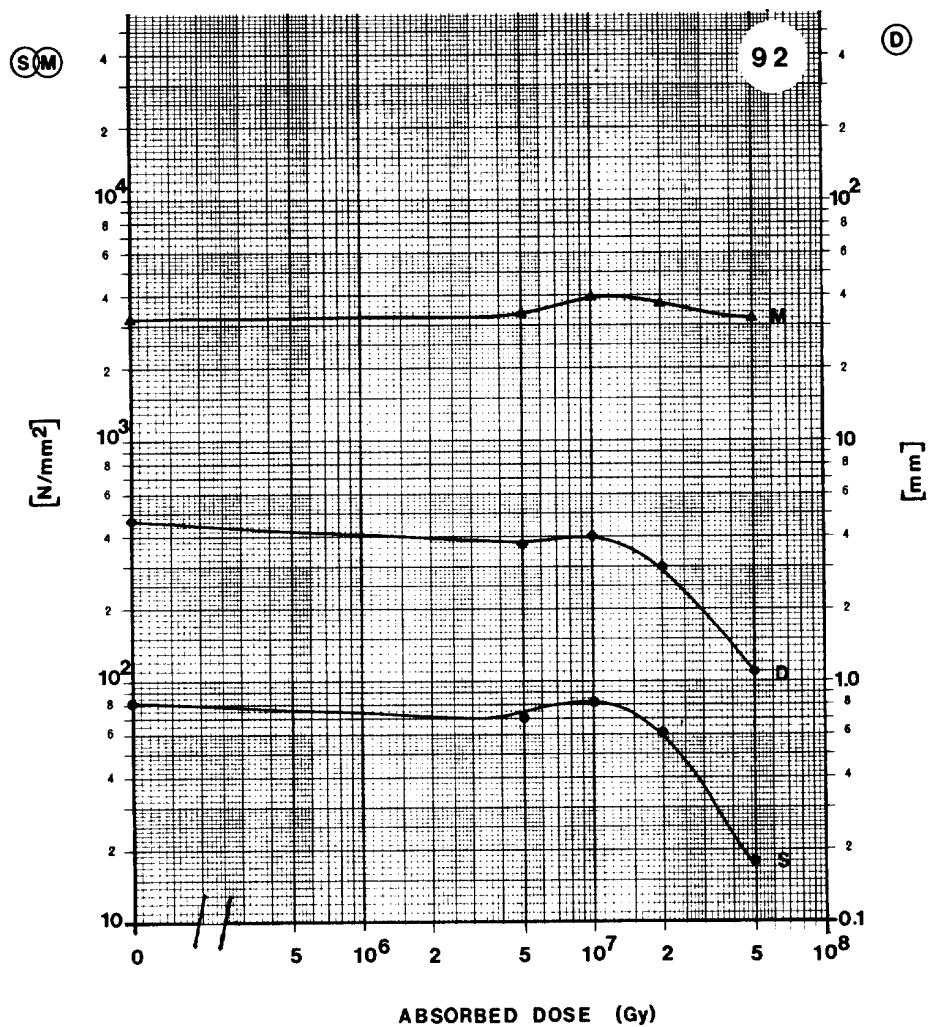
Remarks: PREPARED FOR ISR MAGNETS AND USED SINCE THEN



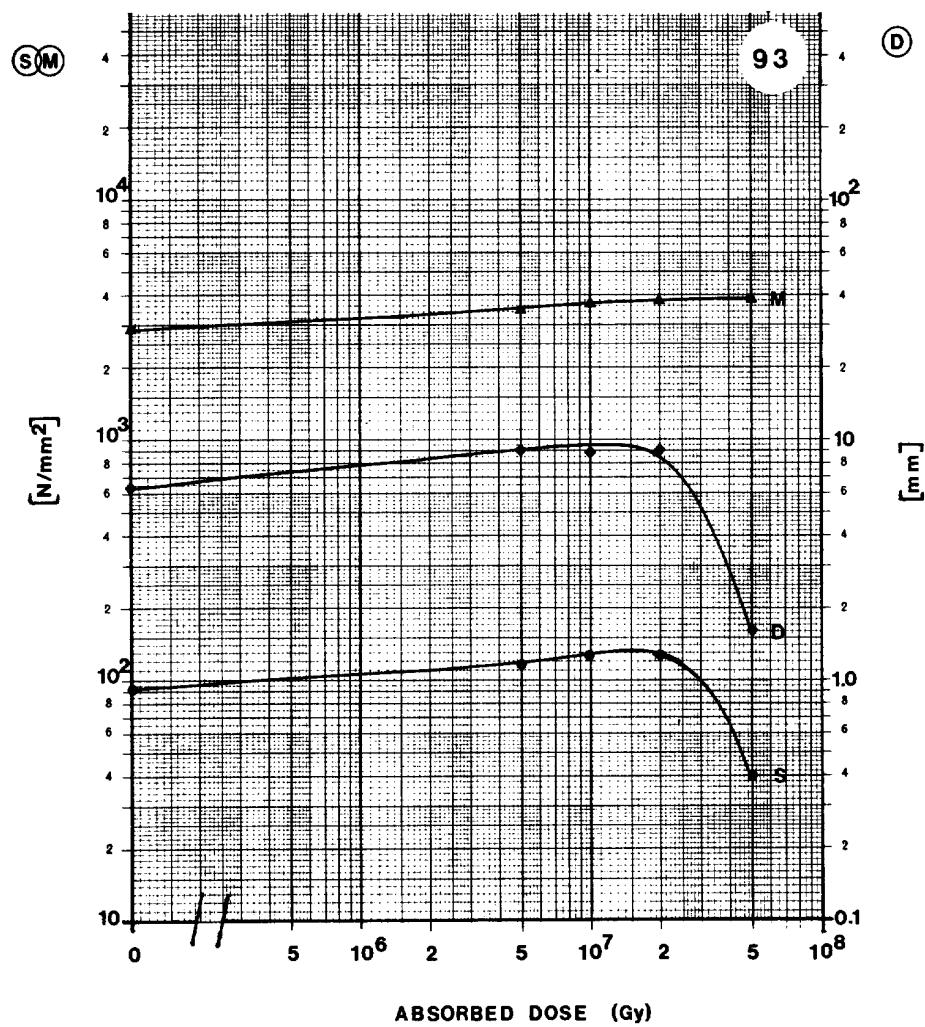
CURVE	PROPERTY	INITIAL VALUE
S	Ultimate flexural strength	131.5 N/mm^2
D	Deflexion at break	9.3 mm
M	Modulus of elasticity	$3.6 \times 10^3 \text{ N/mm}^2$

MATERIAL: EPN 1139(100) + HY 906(87.5) + X157/2505(0.5)**SUPPLIER:** ALSTHOM**Remarks:**

CURVE	PROPERTY	INITIAL VALUE
S	Ultimate flexural strength	130.5 N/mm^2
D	Deflection at break	6.7 mm
M	Modulus of elasticity	$4.0 \times 10^3 N/mm^2$

MATERIAL: DEN 438 + MNA**SUPPLIER:** DOW**Remarks:**

CURVE	PROPERTY	INITIAL VALUE
S	Ultimate flexural strength	83.4 N/mm ²
D	Deflection at break	4.7 mm
M	Modulus of elasticity	3.2 × 10 ³ N/mm ²

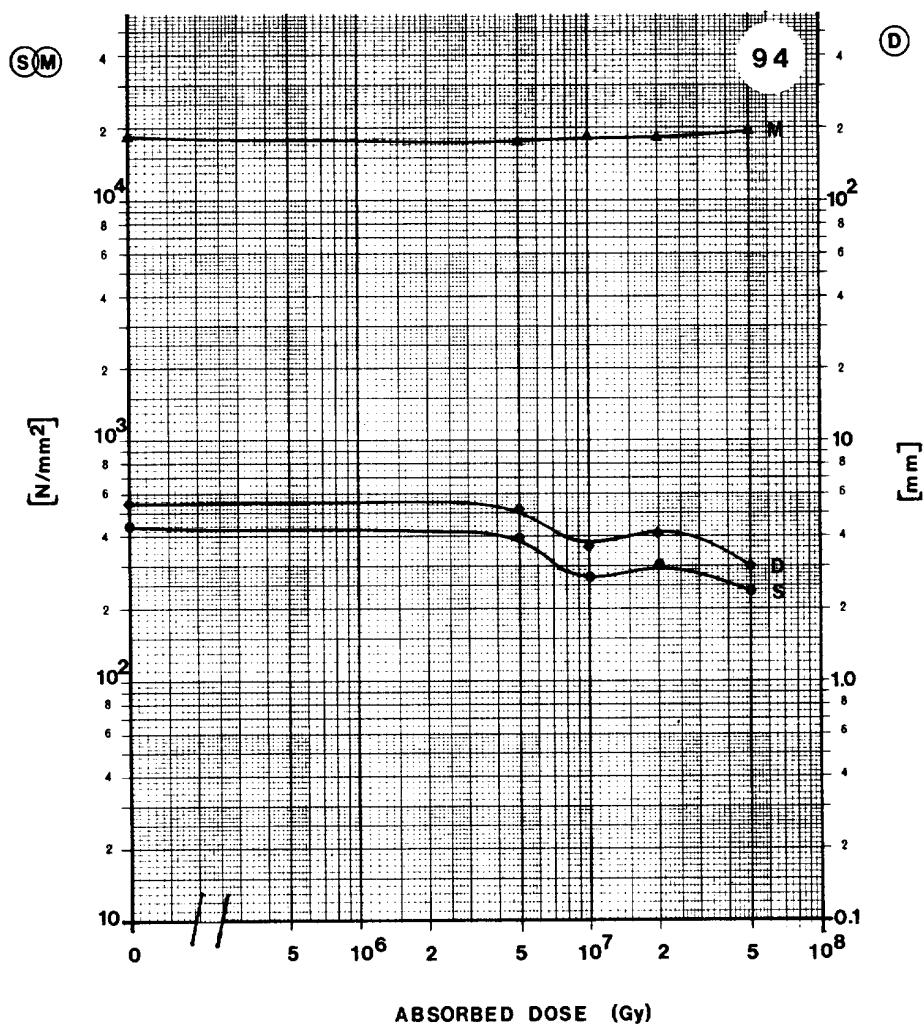
MATERIAL: DEN 431 + MDA**SUPPLIER:** DOW**Remarks:**

CURVE	PROPERTY	INITIAL VALUE
S	Ultimate flexural strength	92.2 N/mm ²
D	Deflexion at break	6.4 mm
M	Modulus of elasticity	2.9 x 10 ³ N/mm ²

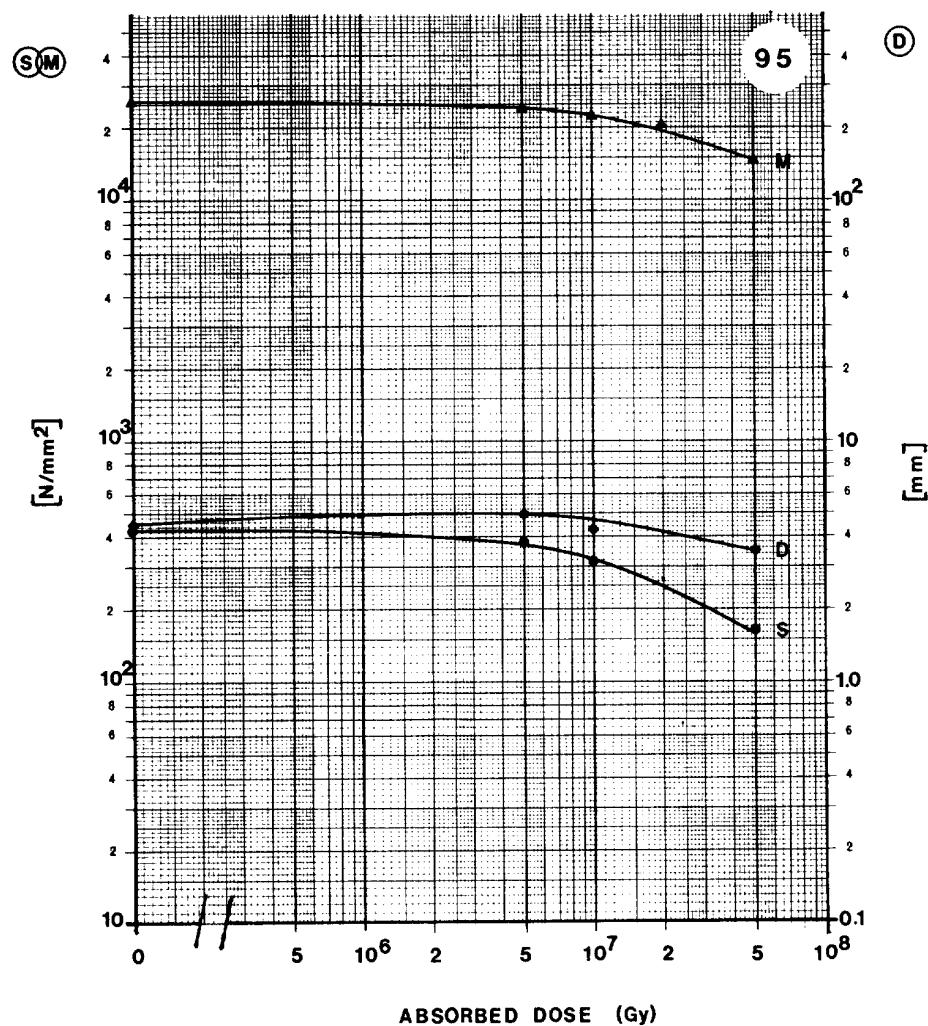
MATERIAL: EPIKOTE 154 + MMA + GLASS TAPE

SUPPLIER: MICAFIL

Remarks:



CURVE	PROPERTY	INITIAL VALUE
S	Ultimate flexural strength	441.4 N/mm^2
D	Deflexion at break	5.5 mm
M	Modulus of elasticity	$1.9 \times 10^4 N/mm^2$

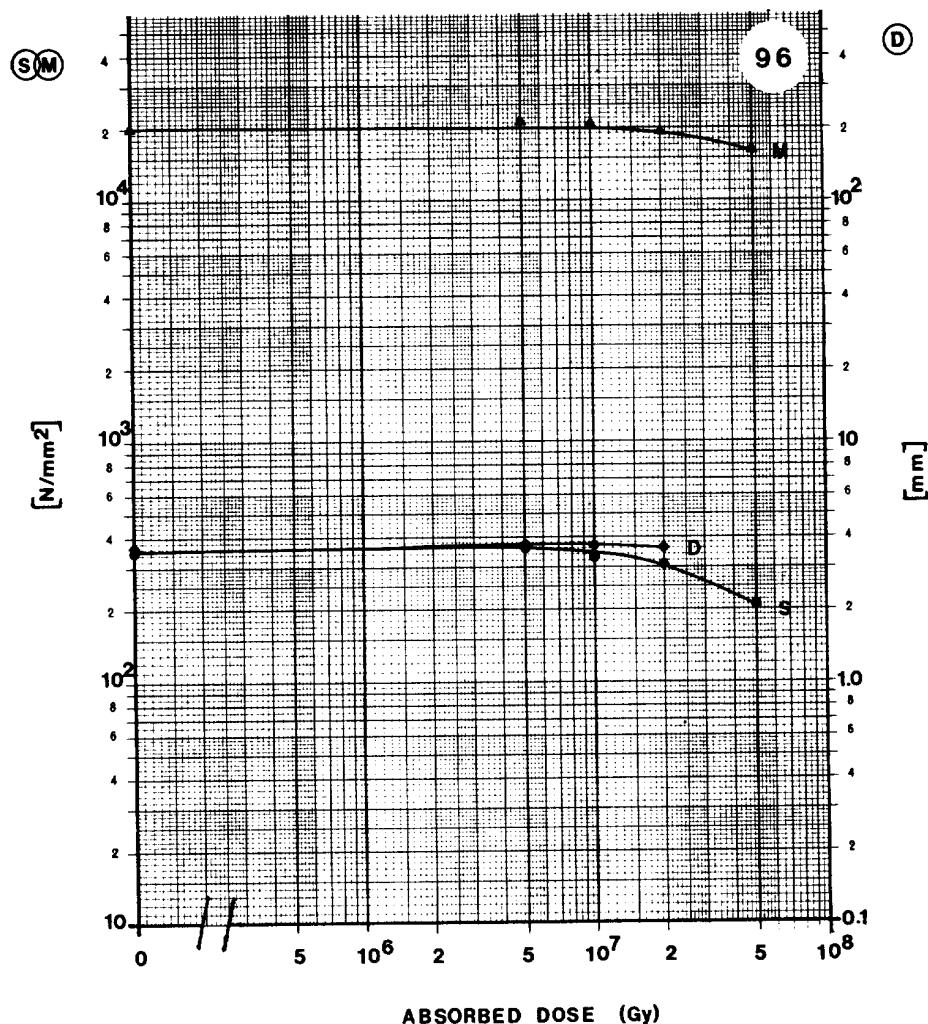
MATERIAL: EPIKOTE 154 + DDS + GLASS FABRIC**SUPPLIER:** MICAFIL**Remarks:**

CURVE	PROPERTY	INITIAL VALUE
S	Ultimate flexural strength	430.6 N/mm^2
D	Deflexion at break	4.5 mm
M	Modulus of elasticity	$2.5 \times 10^4 N/mm^2$

MATERIAL: EPIKOTE 154 + DDM + GLASS FABRIC

SUPPLIER: MICAFIL

Remarks:



CURVE	PROPERTY	INITIAL VALUE
S	Ultimate flexural strength	351.2 N/mm ²
D	Deflexion at break	3.6 mm
M	Modulus of elasticity	2.0 × 10 ¹⁰ N/mm ²

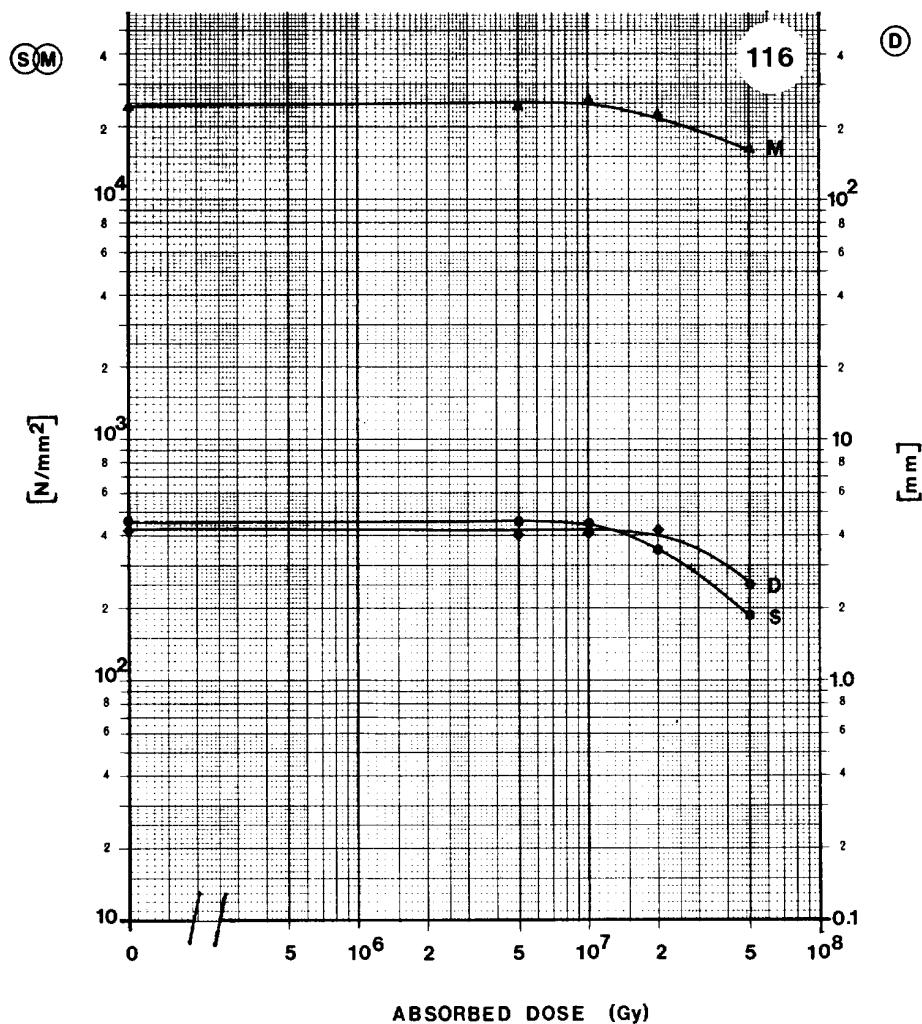
NOVOLAC

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MATERIAL: EPOXY Novolac 438 + HY 906 + GLASS FABRIC

SUPPLIER: ISOLA

Remarks:

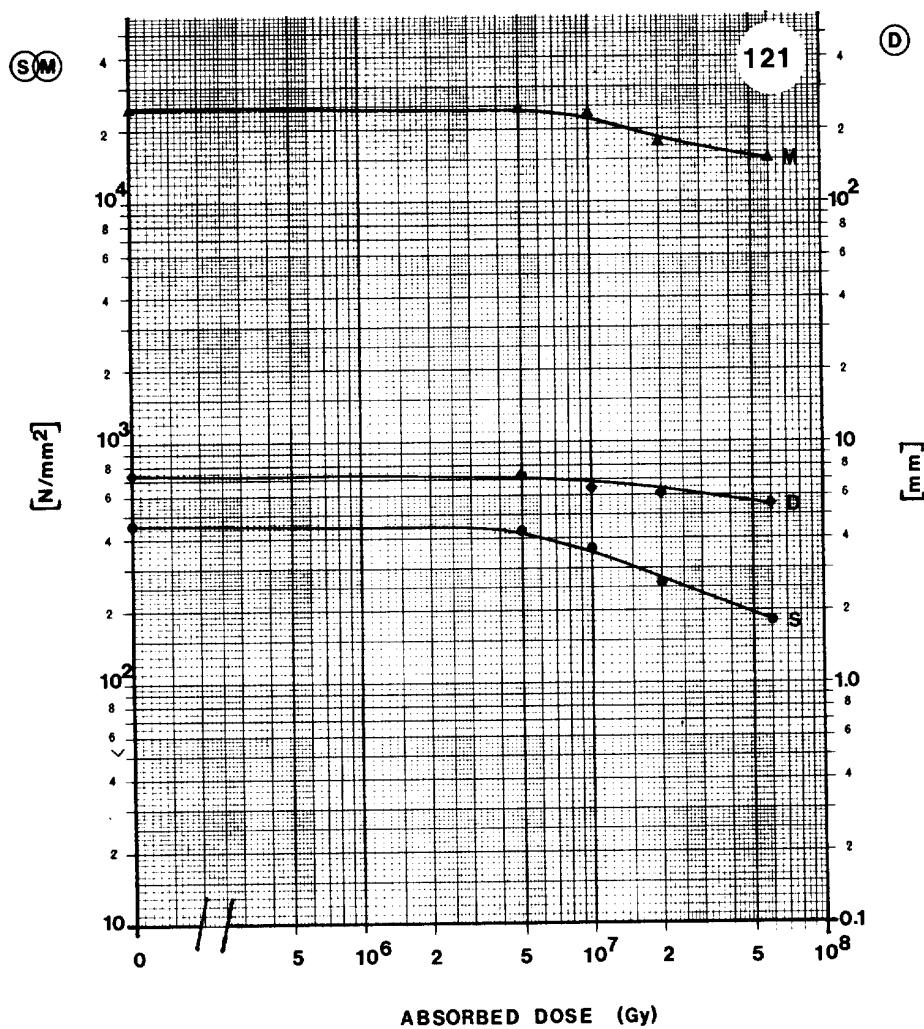


CURVE	PROPERTY	INITIAL VALUE
S	Ultimate flexural strength	458.1 N/mm ²
D	Deflexion at break	4.1 mm
M	Modulus of elasticity	2.4×10^4 N/mm ²

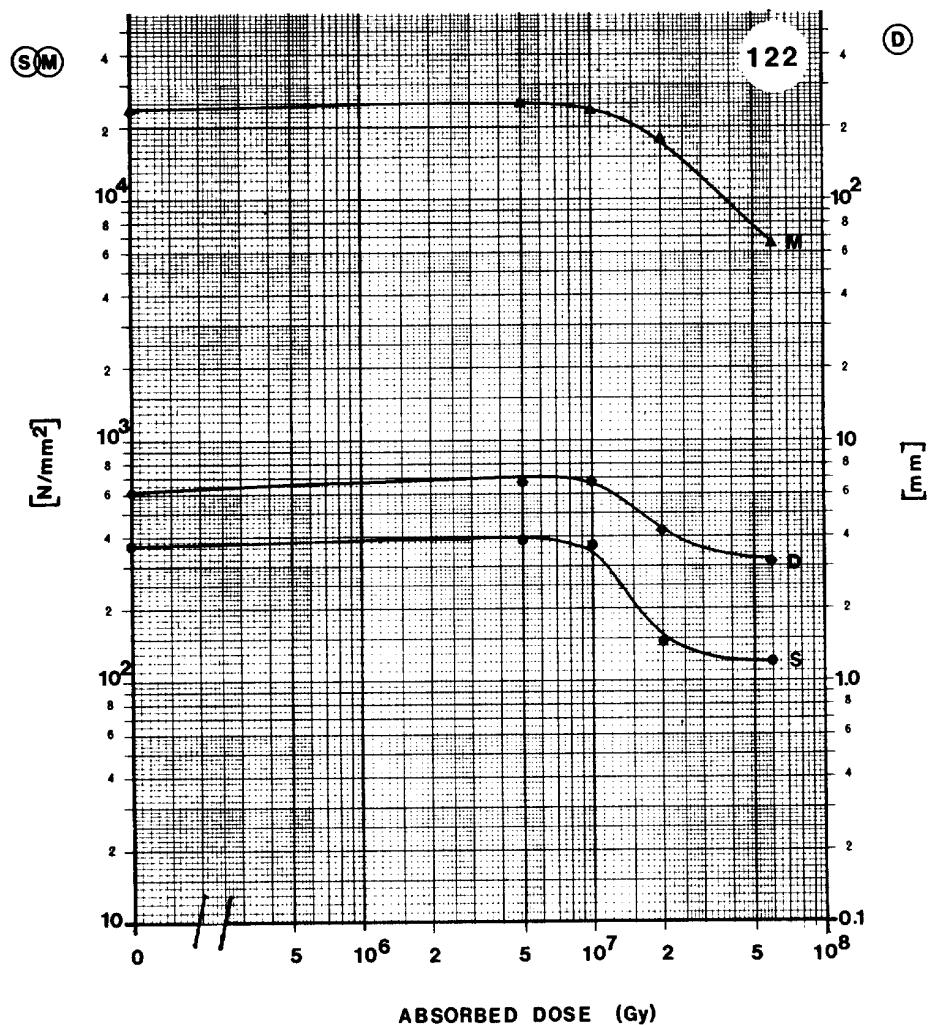
MATERIAL: EPOXY NOVOLAC 431 + MNA + ACCELERATOR

SUPPLIER: ISOLA

Remarks:



CURVE	PROPERTY	INITIAL VALUE
S	Ultimate flexural strength	464.0 N/mm^2
D	Deflection at break	7.2 mm
M	Modulus of elasticity	$2.4 \times 10^4 \text{ N/mm}^2$

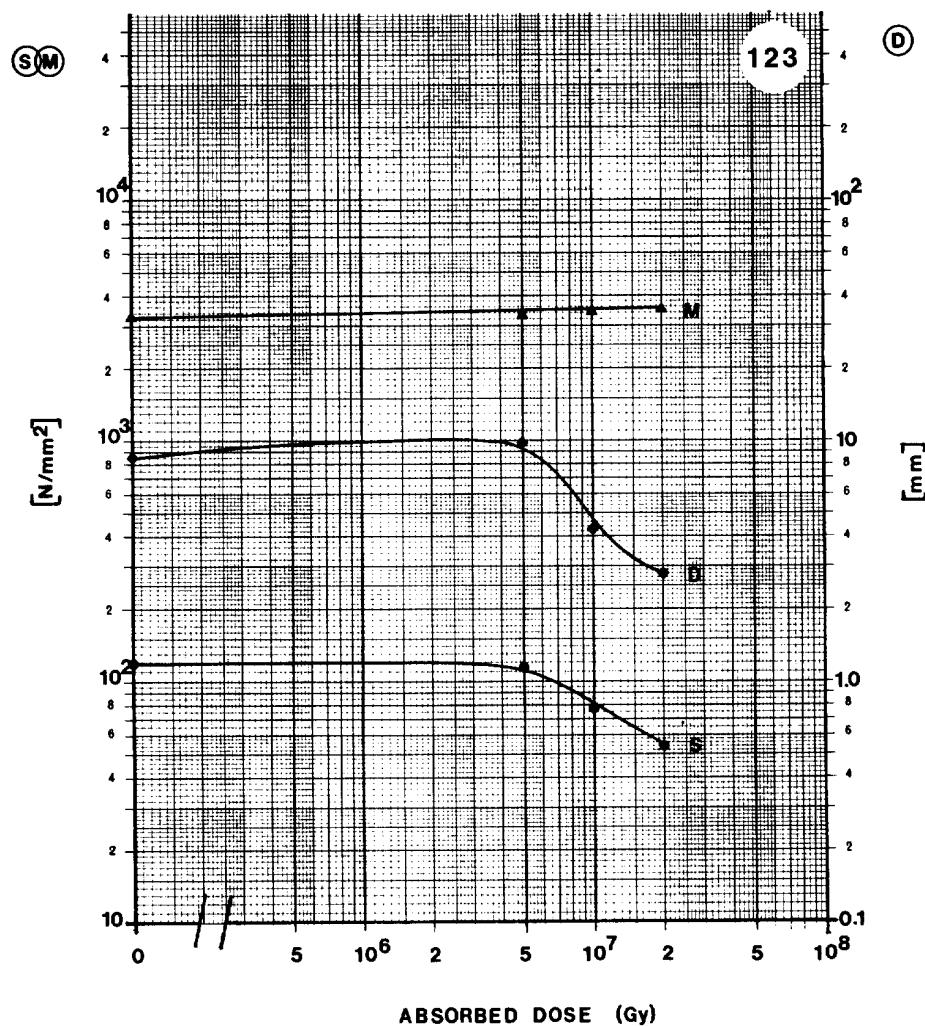
MATERIAL: EPOXY NOVOLAC 431 + BF₃ MEA COMPLEX**SUPPLIER:** ISOLA**Remarks:**

CURVE	PROPERTY	INITIAL VALUE
S	Ultimate flexural strength	363.9 N/mm^2
D	Deflexion at break	6.1 mm
M	Modulus of elasticity	$2.4 \times 10^4 \text{ N/mm}^2$

MATERIAL: EPN 1138(50) + MY 745(50) + HY 905(103) + XB 2687(0.25)

SUPPLIER: ALSTHOM

Remarks: ISR RESIN WITHOUT FLEXIBILIZER



CURVE	PROPERTY	INITIAL VALUE
S	Ultimate flexural strength	118.7 N/mm ²
D	Deflection at break	8.4 mm
M	Modulus of elasticity	3.3×10^3 N/mm ²

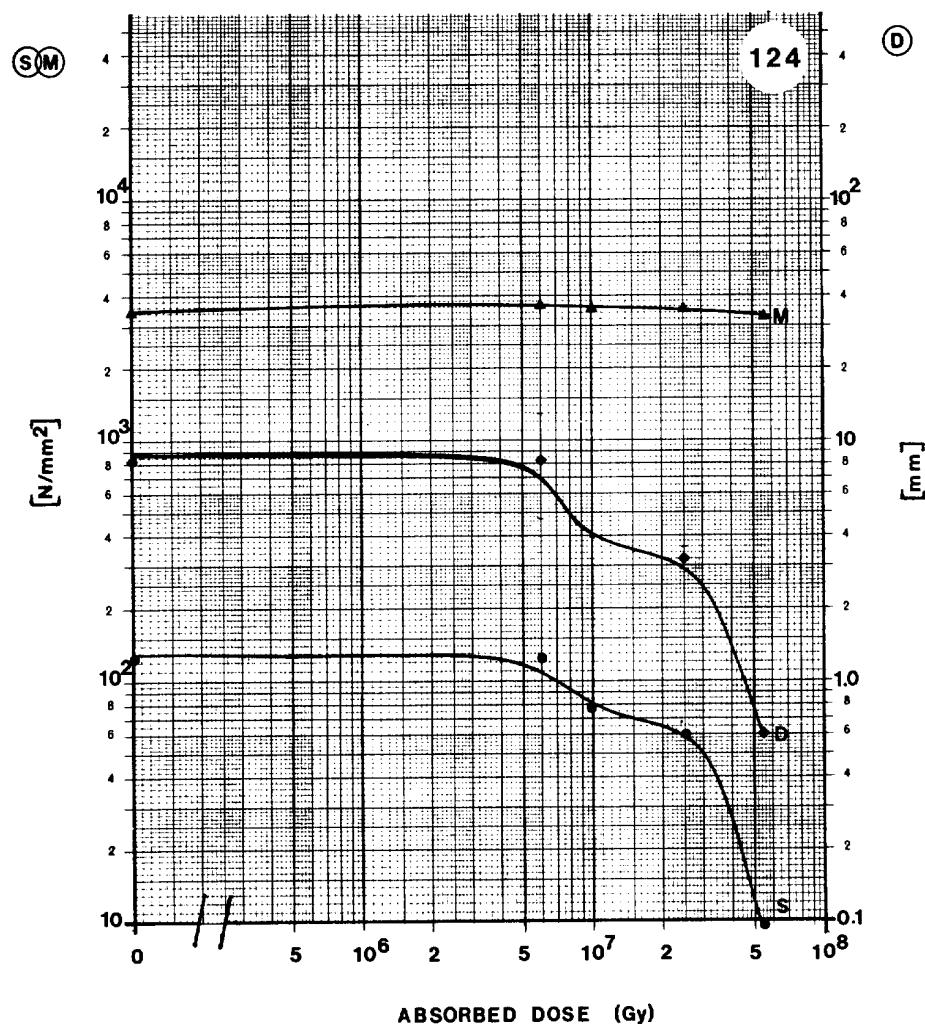
NOVOLAC

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MATERIAL: EPN 1139(100) + HY 905(97.5) + XB 2687(0.2)

SUPPLIER: ALSTHOM

Remarks:

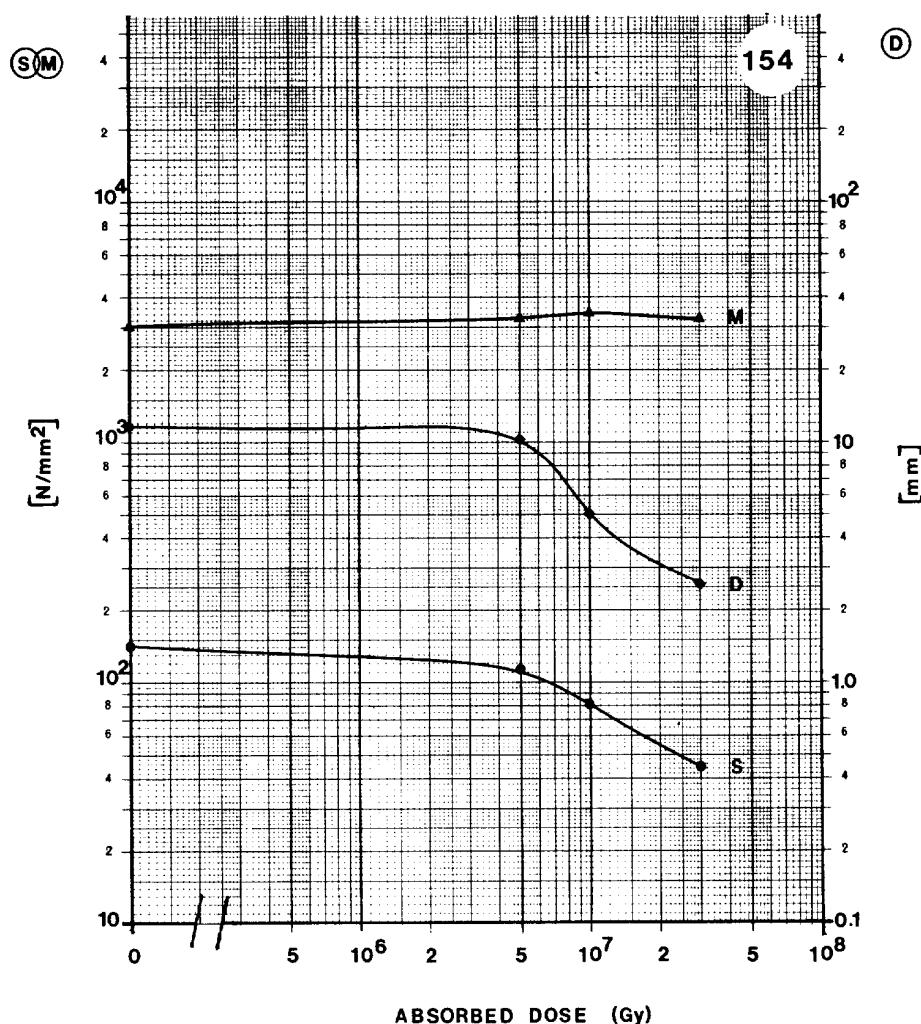


CURVE	PROPERTY	INITIAL VALUE
S	Ultimate flexural strength	124.6 N/mm ²
D	Deflexion at break	8.3 mm
M	Modulus of elasticity	3.5 × 10 ³ N/mm ²

MATERIAL: EP 154(50) + EP 828(50) + DX 126(60) + DX 127(22) + ACCELERATOR

SUPPLIER: SHELL

Remarks:

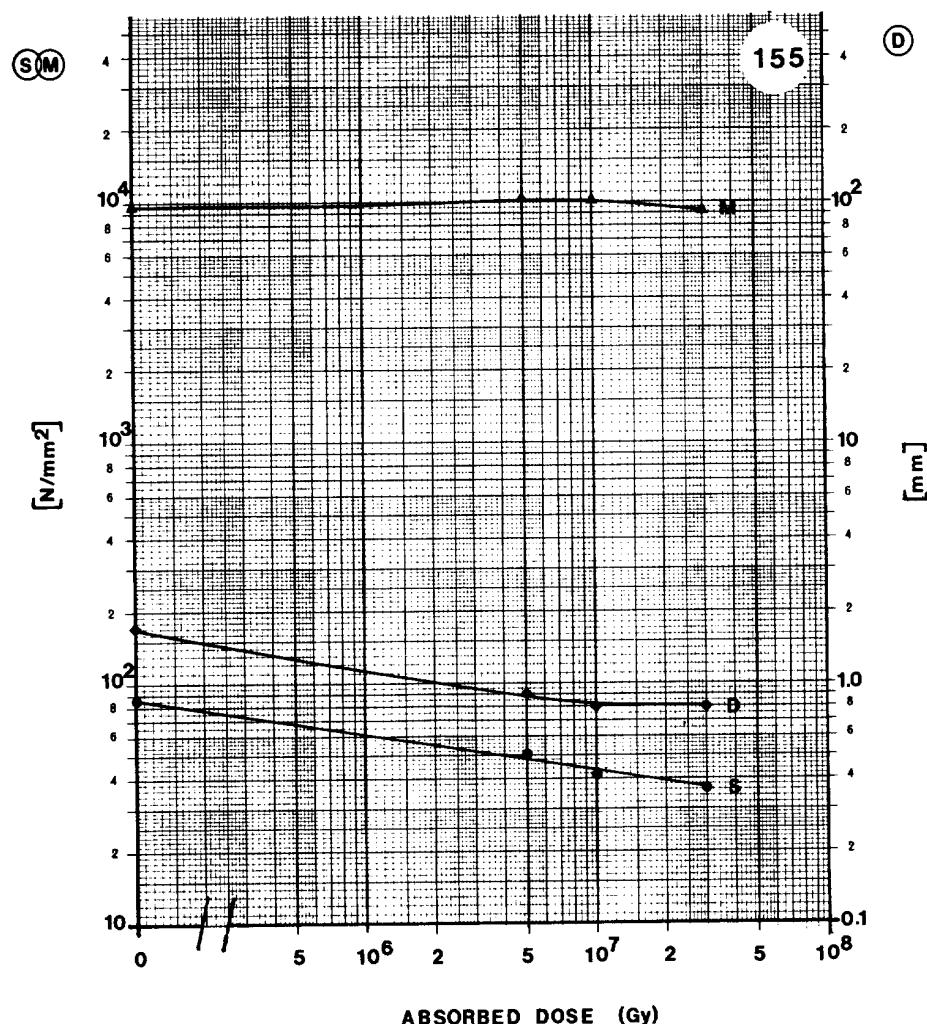


CURVE	PROPERTY	INITIAL VALUE
S	Ultimate flexural strength	145.2 N/mm ²
D	Deflexion at break	11.5 mm
M	Modulus of elasticity	3.0 × 10 ³ N/mm ²

MATERIAL: EP 154(50) + EP 828(50) + DX 126(60) + DX 127(22) +
+ SILICA(300) + ACCELERATOR

SUPPLIER: SHELL

Remarks:

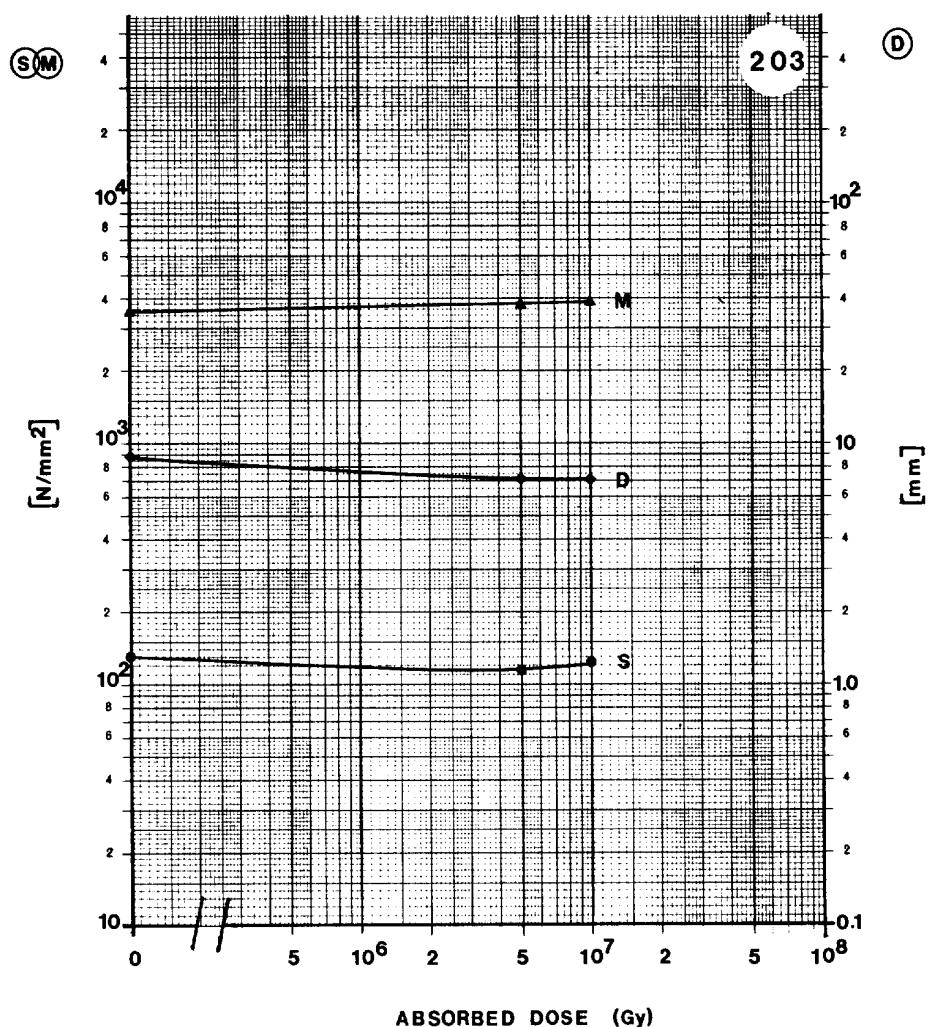


CURVE	PROPERTY	INITIAL VALUE
S	Ultimate flexural strength	86.3 N/mm^2
D	Deflexion at break	1.7 mm
M	Modulus of elasticity	9.6×10^3 N/mm^2

MATERIAL: EPN 1138(100) + HY 906(95) + DY 062(0.5)

SUPPLIER: CIBA-GEIGY

Remarks:

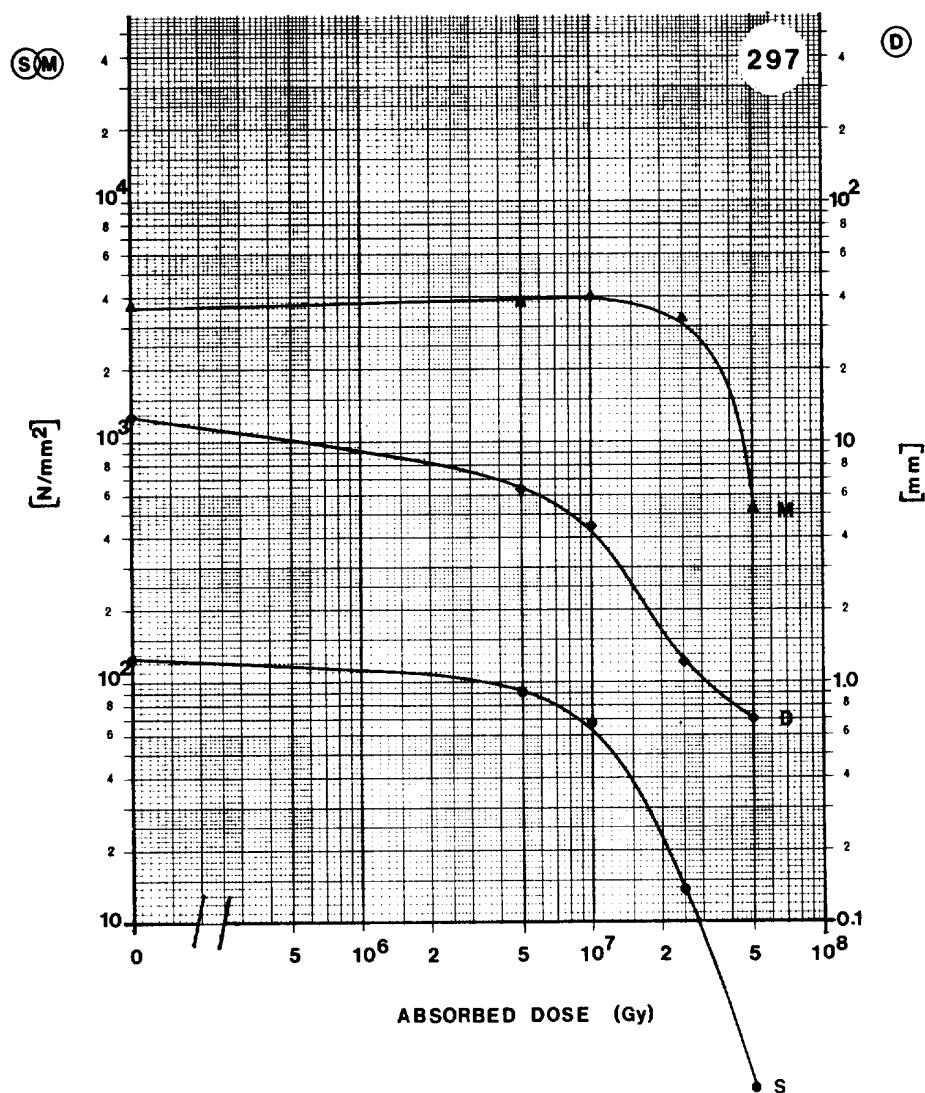


CURVE	PROPERTY	INITIAL VALUE
S	Ultimate flexural strength	130.5 N/mm ²
D	Deflexion at break	8.7 mm
M	Modulus of elasticity	3.5 × 10 ³ N/mm ²

MATERIAL: EPN 1138(50) + MY 745(50) + CY 221(20) + HY 905(120) +
+ XB 2687(0,3)

SUPPLIER: CIBA-GEIGY

Remarks:

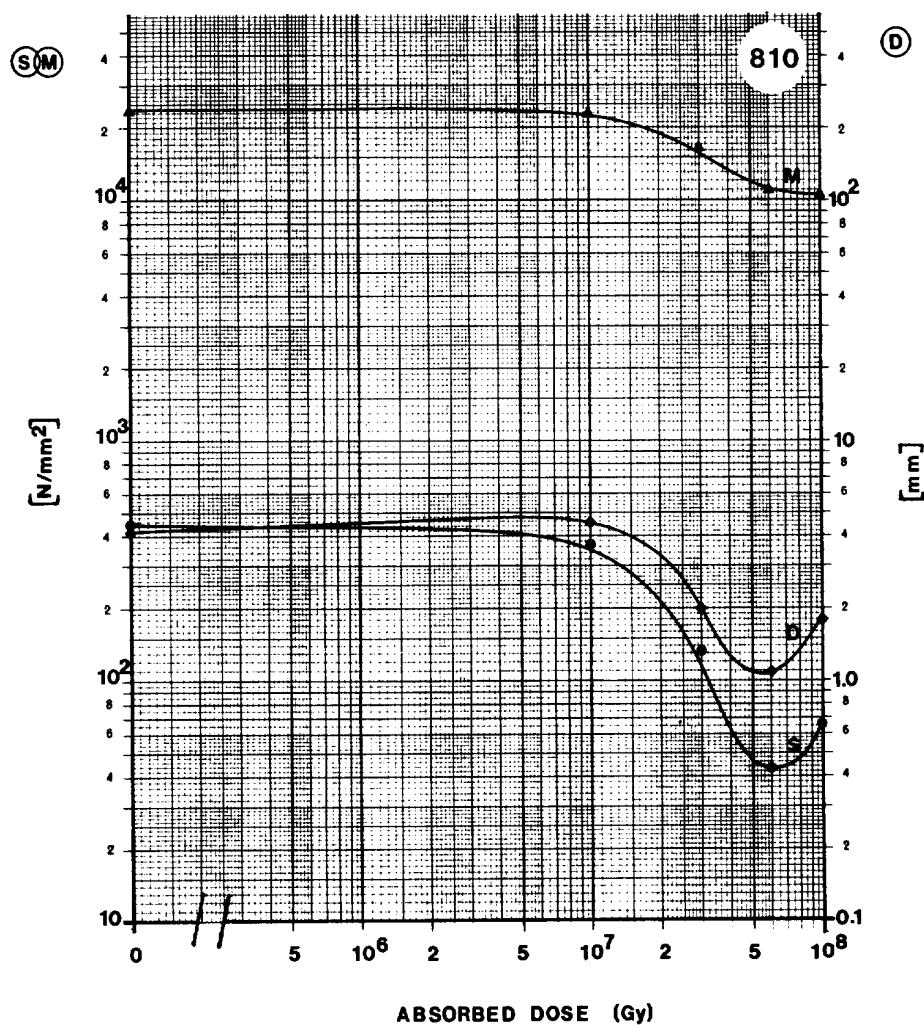


CURVE	PROPERTY	INITIAL VALUE
S	Ultimate flexural strength	124.2 N/mm^2
D	Deflection at break	12.4 mm
M	Modulus of elasticity	$3.7 \times 10^3 \text{ N/mm}^2$

MATERIAL: VETRESIT 14; EPIKOTE 827 + DDS + GLASS TISSUE

SUPPLIER: MICAFIL

Remarks:



CURVE	PROPERTY	INITIAL VALUE
S	Ultimate flexural strength	445.4 N/mm ²
D	Deflection at break	4.2 mm
M	Modulus of elasticity	2.4×10^4 N/mm ²

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ORLITHERM

Trade name of BBC Baden
for epoxy resins based on DGEBA with MNA
see ARALDITE F

